Abstract

A software method is disclosed for modeling dielectric losses in transmission lines, such as lines on a computer chip or circuit board, using a circuit simulation application, such as a SPICE program. Line resistance, self-inductance, and self-capacitance are calculated and modeled as a lumped element circuit having a resistor and an inductor connected in series, with a capacitance in parallel. A two-port scattering matrix is used to model the dielectric losses. The method uses a matrix that is related to the dielectric constant of the medium surrounding the line, the length of the line, and the frequency of the signal. The method assumes low loss conditions typical of circuit boards or integrated circuit chips, whereby the intrinsic impedance of the line is not affected by losses and the matrix is normalized to the intrinsic impedance.